



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

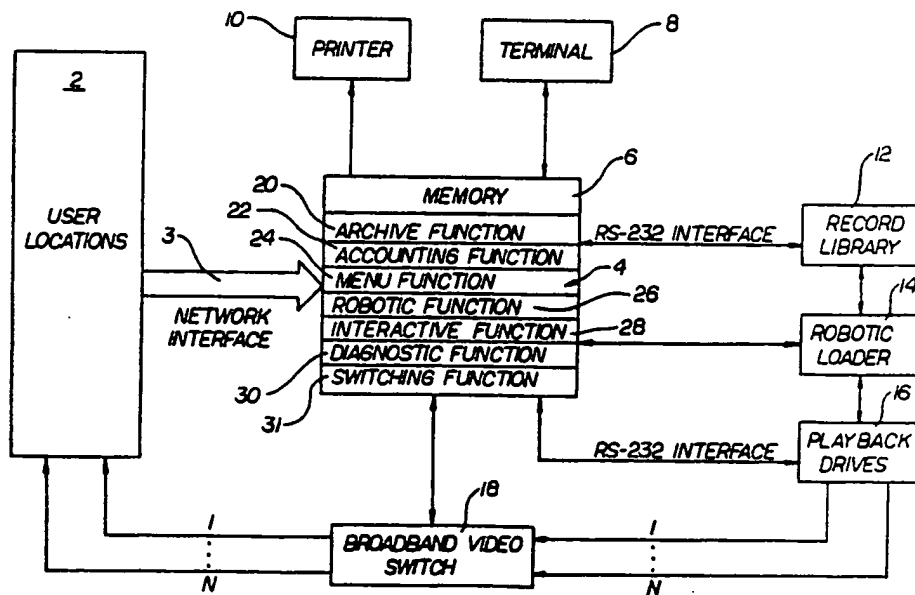
|   |           |   |
|---|-----------|---|
| (51) International Patent Classification 5 :<br><b>G11B 17/22, 15/18, G06F 15/00<br/>H07J 1/16</b>  | <b>A1</b> | (11) International Publication Number: <b>WO 94/03894</b><br>(43) International Publication Date: <b>17 February 1994 (17.02.94)</b>  |
| (21) International Application Number: <b>PCT/US93/07318</b><br>(22) International Filing Date: <b>6 August 1993 (06.08.93)</b><br>(30) Priority data: <b>07/926,327 10 August 1992 (10.08.92) US</b><br>(71) Applicant: <b>E-SYSTEMS, INC. [US/US]; 6250 LBJ Free-way, Dallas, TX 75240 (US).</b><br>(72) Inventor: <b>EARLY, Gary, Raymond ; 1611 Serenade Lane, Richardson, TX 75081 (US).</b><br>(74) Agents: <b>MEIER, Harold, E. et al.; Gardere &amp; Wynne, 1601 Elm Street, Suite 3000, Dallas, TX 75201 (US).</b> |           | (81) Designated States: <b>AU, CA, FI, JP, NO, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</b><br><br><b>Published</b><br><i>With international search report.</i><br><i>With amended claims.</i> |

(54) Title: **BROADBAND SERVICES DELIVERY SYSTEM**

## (57) Abstract

A method and apparatus for presenting recorded entertainment and educational selections to a plurality of user locations (2), including a controller (4) connected to a storage library (12), a plurality of playback drives (16) and a robotic loader (14). The controller (4) accepts requests from a user location (2) and processes the request causing the robotic loader (14) to remove the requested selection from the storage library (12) and load the selection into a playback drive (16). The controller (4) connects the playback device (16) containing the selection with the user location (2) making the request, and the selection is transmitted to the user. The system

contains interactive capabilities allowing the user location (2) to operate the playback drive (16). User control of a recorded selection is limited to a predefined period of time. The system also provides a menu function allowing the user to choose a selection by scrolling through a menu arranged by broad categories, or the user may choose a specific selection by entering a coded number corresponding to the selection. The system is modular in construction allowing for easy expansion and repair.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

|    |                          |    |                                       |    |                          |
|----|--------------------------|----|---------------------------------------|----|--------------------------|
| AT | Austria                  | FR | France                                | MR | Mauritania               |
| AU | Australia                | GA | Gabon                                 | MW | Malawi                   |
| BB | Barbados                 | GB | United Kingdom                        | NE | Niger                    |
| BE | Belgium                  | GN | Guinea                                | NL | Netherlands              |
| BF | Burkina Faso             | GR | Greece                                | NO | Norway                   |
| BG | Bulgaria                 | HU | Hungary                               | NZ | New Zealand              |
| BJ | Benin                    | IE | Ireland                               | PL | Poland                   |
| BR | Brazil                   | IT | Italy                                 | PT | Portugal                 |
| BY | Belarus                  | JP | Japan                                 | RO | Romania                  |
| CA | Canada                   | KP | Democratic People's Republic of Korea | RU | Russian Federation       |
| CF | Central African Republic | KR | Republic of Korea                     | SD | Sudan                    |
| CG | Congo                    | KZ | Kazakhstan                            | SE | Sweden                   |
| CH | Switzerland              | LI | Liechtenstein                         | SI | Slovenia                 |
| CI | Côte d'Ivoire            | LK | Sri Lanka                             | SK | Slovak Republic          |
| CM | Cameroon                 | LU | Luxembourg                            | SN | Senegal                  |
| CN | China                    | LV | Latvia                                | TD | Chad                     |
| CS | Czechoslovakia           | MC | Monaco                                | TC | Togo                     |
| CZ | Czech Republic           | MG | Madagascar                            | UA | Ukraine                  |
| DE | Germany                  | ML | Mali                                  | US | United States of America |
| DK | Denmark                  | MN | Mongolia                              | UZ | Uzbekistan               |
| ES | Spain                    |    |                                       | VN | Viet Nam                 |
| FI | Finland                  |    |                                       |    |                          |

- 1 -

## BROADBAND SERVICES DELIVERY SYSTEM

### TECHNICAL FIELD

The present invention relates to video and audio delivery systems, and more particularly to a system for delivering interactive video and audio programs to a plurality of independent remote user locations.

5

- 2 -

## BACKGROUND OF THE INVENTION

Present cable entertainment options are somewhat limited. Current cable television options are restricted to either signing up for a movie channel and being limited to viewing what the channel offers or using a pay-per-view channel allowing the user to pay only for the movies the user chooses to watch but at a much higher per movie price.

The major problem with these options is the lack of control over which movies are shown and the time at which the movies are shown. If the selections chosen by the cable programmer or hotel operator are not interesting or convenient, the selections have no entertainment value to the user. Another problem with cable channels is the lack of interactive capability. The user is limited to watching a selection in the time and manner presented by the cable channel.

The other option to cable entertainment is renting or purchasing a video cassette recording of a movie. However, the alternative requires the user to travel to a store stocking the desired video cassette to obtain a copy of the movie, and then the desired movie may not be available at the store when the user desires to rent or buy it.

Thus, a need has arisen for a method and apparatus to present an entertainment selection to the user's location at a time and manner chosen by the user individual.

- 3 -

## SUMMARY OF THE INVENTION

The present invention overcomes the foregoing and other problems by creating a broadband service delivery system. The apparatus of the present invention is operated  
5 by a central controller which is the heart of the system.

The controller presents to a user a menu of recorded selections at the user's location, or the user may directly select a specific entertainment selection (e.g. a movie) by entering its coded index number. The controller receives  
10 instructions over a local area network from the remote user requesting a particular selection. The selection is maintained in a recorded library of entertainment and educational programs. The controller responds to these instructions by commanding a robotic loader to retrieve a  
15 record of the requested selection from the library and load the record into one of a plurality of record playback drives.

The controller also activates a transmission system to have the requested selection transmitted to the user  
20 location and also records the use of the selection for accounting purposes. The interface with the user location is interactive allowing the selection to be viewed by the user in any manner desired. However, a maximum time limit is set on the period a user may control a particular  
25 selection to prevent monopolization of a selection.

- 4 -

## BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following detailed description taken in conjunction  
5 with the accompanying drawings.

FIGURE 1 is a block diagram of a broadband services delivery system in accordance with the present invention.

FIGURES 2a and 2b is a flow diagram illustrating the operation of the broadband services delivery system.

- 5 -

## DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGURE 1 wherein there is shown a block diagram of the broadband delivery system of the present invention. A plurality of user locations 2 are interconnected by an interface channel 3 to enable communication with a system controller 4. The controller 4 is the central unit of the system and interconnects to all components of the system. Storage of the control software of the system and other data is provided in a memory 6 as a part of the controller 4.

An input terminal or console 8 connects to the controller 4 to allow a system operator to access the system for the input of control information and for setting desired accounting procedures. Also, a printer 10 connects to the controller 4 for printing billing statements to users.

A library 12 of recorded entertainment, e.g. a record library, is connected to the controller 4 through a standard RS-232 interface. The library 12 contains a variety of entertainment and educational selections archived in a data base stored in the memory 6 of the controller 4. The library 12 is of modular construction and consists of a plurality of storage areas for receiving a storage tray containing a record. Sections of the library 12 may be easily added to or removed from the

- 6 -

library 12 since it consists of a plurality of storage modules.

The library 12 is interactive with a robotic loader 14. The robotic loader 14 handles a single storage tray for loading and unloading into one of a plurality of playback drives 16. The playback drives 16 receive a storage tray from the robotic loader 14 and retrieves the data stored on the enclosed recorded medium for transmission to a user location 2. Each playback drive 16 is connected to the controller 4 through a port concentrator (not shown) via a standard RS-232 or SCSI interface. The port concentrator allows the controller 4 to be attached to up to one hundred playback drives 16 through a single input/output port. The playback drives 16 are constructed in a modular fashion allowing for the addition or removal of drives with minimal effects on the system.

The playback drives 16 are selected to withstand extensive use with limited downtime. Typically, a playback drive 16 will play both A and B sides of a record without flipping the record. The video output from the drive 16 follows National Television Standards Committee video format specifications. The audio output is digital two channel stereo with an output level of at least 500 mV.



- 7 -

The playback drives 16 play both Constant Angular Velocity and Constant Linear Velocity records.

Each playback drive 16 and the controller 4 are connected to a broadband video switch 18 as a part of a local area network. The switch 18 is of conventional design and no further description is required for an understanding of the present invention. The switch 18 receives a plurality of inputs from the playback drives 16 and connects one of these inputs to a single user or multiple user locations 2 requesting a selection. The connection is made through a provider supplied local area network.

To maintain the library 12 current with desired entertainment and educational selections, the controller 4 includes an archive function 20 to track the location and usage of the individual records. The archive function 20 tracks each entertainment and educational record in the system. Thus, when a request for a particular selection is received from a user location 2, the system locates the selection and responds to the request. If the selection is not available, it may be reserved for a user location 2 at the next available time period. The archive function 20 also records the time a selection is actuated in a playback drive 16 allowing the controller 4 to predict when the selection will next be available for use. The archive

- 8 -

function 20 also assigns unique n-digit codes to each selection within the system to allow a user to directly request a selection without going through the menu selections, to be discussed later. Finally, the archive  
5 function 20 allows the controller 4 to maintain record queuing in the event a selection is on multiple records.

The controller 4 also contains an accounting function 22 allowing the generation of user billing information. The accounting function 22 allows the controller 4 to track  
10 usage of recorded entertainment and educational programs, to track any selection request delivered or rejected, and to track any type of date and time stamp entry by the system for each user location 2. Using this data, the accounting function 22 generates accounting reports and  
15 provides a hard copy by means of the system printer 10. The accounting function 22 also provides the option of generating accounting reports showing different information or different formats of accounting information.

A menu function 24 is available in the controller 4 to  
20 allow a user to browse through the available selections before making a choice. The menu function 24 maintains a data base of all available selections within the library 12. The menu function 24 initially offers the user broad categories of selections such as horror, drama, science  
25 fiction, etc. or categories offering selections by actor,

- 9 -

actress or director. The user makes a selection within these broad categories. Another aspect of the menu function 24 allows a user to directly access a selection by entering its assigned multi-digit code. This allows the user to bypass the step of scrolling through a selection menu.

The controller 4 includes a robotic function 26 to control the mechanical operation of the robotic loader 14. The robotic function 26 converts user requests received over the local area network into commands for the robotic loader 14 to retrieve a record from the library 12 and load the record into a playback drive 16. The robotic function 26 also generates commands to the robotic loader 14 to remove a record when a showing of the selection is complete.

The interactive function 28 as a part of the controller 4 permits the user to have the same playback or interactive capabilities that exist in a VCR. The interactive function 28 allows the user to search or backup the selection, as well as chapter search, scan, pause, start or exit. However, the interactive function 28 does not allow user abuse of these capabilities. A user is limited to controlling a record for a period of time equal to the length of the program on the record plus a predetermined time period.

- 10 -

A diagnostic function 30 is programmed into the controller 4 to enable self-check of the included functions and interconnected hardware of the system. Start-up diagnostics will identify any discrepancies during system initialization. System self-diagnostics will report unit failures to the controller 4 allowing corrective measures to be taken. Also included are off-line diagnostics to aid in fault isolation during repair of the system.

Finally, a switching function 31 enables the controller 4 to control the broadband video switch 18. The switching function 31 also enables a playback drive 16 transmitting a requested selection to be connected to a single user location 2 or multiple user locations requesting the selection.

Referring now to FIGURE 2, there is illustrated a flow chart for describing how the system functions in response to a user request. In response to a request, a user location 2 is presented a list of available selections at step 40. The controller 4 monitors the user location at step 42 for a request for a recorded selection. When inquiry step 44 determines the user location has made a request, the controller 4 activates the archive function 20 to process the request at step 46 and determine if the requested selection is presently available.

- 11 -

If the selection is available, the robotic function 26 is actuated at step 48 to command the robotic loader 14 to retrieve the selected record from its storage area in the library 12 and load the record into an available playback drive 16. The archive function 20 notes the "in use" status of the selected record at step 50, and the accounting function 22 records the use of the record by the user for future billing purposes at step 52.

The controller 4 next sends a command to the playback drive 16 containing the record to begin transmission of the selection at step 54. The controller 4 actuates the broadband video switch 18 and the switching function 31 at step 56 to selectively connect the output of the playback drive 16 to the requesting user location or locations 2.

During viewing of the selection, the user location 2 is monitored at step 58 to determine if an interactive function request, such as, pause or rewind, has been requested. If an interactive function request is detected, the controller 4 determines at step 59 if the interactive time period has expired. If not, the interactive function 28 within the controller 4 is activated to process the request, and the controller 4 generates the proper command to the playback drive 16 at step 60. If the interactive time period has expired, the request is not carried out.

- 12 -

After an interactive function request has been completed or if no interactive function has been requested, the controller 4 will next determine at inquiry step 62 if the selection has ended. If the selection has not ended,  
5 control returns to step 58. If the selection has ended, the controller 4 will interrupt the connection between the user location 2 and the playback drive 16 at step 64, and the playback device 16 is stopped at step 66. The robotic function 26 next commands the robotic loader 14 to unload  
10 the record selection from the playback drive 16 and store the selection at step 68 in a location in the library 12 identified by the archive function 20. The archive function 20 will then identify at step 70 that the record is again available for use by other user locations 2.

15 If the requested record selection was not available at step 46, the controller 4 determines at inquiry step 72 if the user location 2 desires to reserve the selection for its next available time slot. If so, the controller 4 reserves at step 74 the time slot for the user. If not,  
20 the user is allowed to exit the system.

Although a preferred embodiment of the invention has been illustrated in the accompanying drawing and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the  
25 embodiment disclosed, but includes of numerous

- 13 -

rearrangements and modifications of parts and elements  
without departing from the spirit of the invention.

- 14 -

# CLAIMS

1. A system for providing to user locations recorded entertainment and educational selections, comprising:

a plurality of entertainment and educational records contained within a plurality of storage trays;

5 means for retrieving information stored on the records for transmission of the information to a user location;

switching means for selectively connecting said means for retrieving to a user location; and

10 controller means responsive to requests received from a user location to activate said means for retrieving and said switching means to enable transmission of the information to a user location.



- 15 -

2. The system of Claim 1, including means for storing each of the plurality of storage trays; and wherein said means for receiving includes: a playback drive; and robotic means for retrieving records from said means for storing.

3. The system of Claim 2, wherein said controller means further includes means responsive to requests received from the user locations during viewing of a record for controlling the operation of the playback drive.

4. The system of Claim 2, wherein said controller means further includes means for actuating said switching means to connect a playback drive to a user location.

5. The system of Claim 1, wherein said controller means further includes accounting means, comprising:

means for storing data identifying each entertainment or educational record connected by said switching means to a user location; and

means for generating an accounting report based on the data identifying each entertainment or educational record connected to a user location.

- 16 -

6. The system of Claim 1, wherein said controller means further includes means for presenting a menu of entertainment and educational records to a user location.

7. The system of Claim 6, wherein the means for presenting a menu comprises a database of entertainment and educational records categorized by subtopics.

8. The system of Claim 1, wherein said controller means further includes directory means for maintaining a record of the location of all of the entertainment and educational records within the system.

9. The system of Claim 8, wherein said directory means further includes means for assigning a unique code number to each entertainment and educational record within the system.

10. The system of Claim 9, wherein said directory further means includes means responsive to a code number for choosing a particular entertainment or education record.

- 17 -

11. The system of Claim 1, wherein said controller means further includes means for providing an intermission period during the viewing of a selected record.

12. The system of Claim 1, wherein said controller means further includes means for reserving an available time slot for a record.

13. The system of Claim 1, wherein said means for controlling further includes means for interactive control of an entertainment or educational record from the user location.

14. The system of Claim 13, further including means for limiting said means for interactive control.

- 18 -

15. A system for transmission of recorded selections to a plurality of user locations, in response to requests from the user locations, comprising:

a plurality of recorded selections;

5 means for storing each of the plurality recorded selections;

a plurality of playback drives for retrieving and outputting information from the recorded selections;

10 a robotic loader for retrieving a recorded selection from the means for storing and loading the selection into a playback drive;

switching means for connecting an output of playback drive to a user location;

15 directory means for maintaining a record of the location of all of the recorded selections;

controller means responsive to requests received from a user location to operate said robotic loader, said playback drives and said switching means to connect an output of a playback drive to a user location.

- 19 -

16. The system of Claim 15, wherein said controller means further comprises means for collecting and recording accounting information on a user location comprising:

5 means for storing data identifying each recorded selection connected by said switching means to a user location; and

means for generating an accounting report based on the stored data identifying each recorded selection connected to a user location.

17. The system of Claim 15 wherein the directory means further comprises:

means for assigning a unique code number to each recorded selection in the means for storing; and

means responsive to the unique code number for selecting a particular recorded selection.

- 20 -

18. The system of Claim 15, further including means for performing diagnostic functions on the system, said means comprising:

5 means for performing off-line diagnostic functions;

means for performing self-diagnostic functions on the system; and

means for performing diagnostic functions during system initialization.

19. The system of Claim 15, wherein said controller means further includes means for controlling a recorded selection from a user location.

20. The system of Claim 19, further including means for limiting said means for controlling.

21. The system of Claim 15, further including means for reserving an available time slot for a recorded selection.

- 21 -

22. A method for presenting a library of recorded selections to a plurality of user locations comprising the steps of:

5       presenting a menu of recorded selections containing information to a user location;

          receiving a request for a recorded selection from the user location;

          retrieving the recorded selection from a storage means for presentation to the user location;

10       transmitting information on the recorded selection to the user location;

          responding to instructions from the user location during transmission of the recorded selection to the user location; and

15       returning the recorded selection to the storage means after completion of the transmission.

- 22 -

23. The method of Claim 22, wherein the step of retrieving the recorded selection further includes the steps of:

determining the availability of the requested  
5 recorded selection;

generating a command to a loading means to remove the recorded selection from the storage means and load the recorded selection into a playback drive; and

reserving the recorded selection for the next  
10 available time period, if said recorded selection is not presently available.

24. The method of Claim 23, wherein the step of returning the recorded selection further includes the step of generating a command to the loading means to unload the recorded selection from the playback drive and return the recorded selection to the storage means.



- 23 -

25. The method of Claim 22, wherein the step of transmitting the recorded selection further includes the steps of:

transferring a retrieved recorded selection to a  
5 playback drive;

generating an output from the playback drive; and

connecting the output of the playback drive to  
the remote user location requesting the recorded selection.

26. The method of Claim 22, wherein the step of presenting a menu further includes the steps of:

assigning coded numbers to each recorded  
selection; and

entering an assigned code number at a user  
location to make a selection of a recorded selection.

- 24 -

27. The method of Claim 22, further including the steps of:

identifying each recorded selection having  
5 information transmitted to a user location;

storing the identification of each recorded  
selection having information transmitted to a user  
location;

generating accounting reports on each identified  
10 recorded selection; and

printing the accounting reports.

## AMENDED CLAIMS

[received by the International Bureau on 7 January 1994 (07.01.94);  
original claims 12-27 cancelled; original claims 1-11 amended (5 pages)]

1. An information delivery system, including:
  - a plurality of media each storing information;
  - a plurality of media access devices each operable for  
accessing stored information from a received medium for  
5 presentation;
  - a plurality of user terminals each including means for  
presenting information and input means for user input  
selection of a medium for presentation and for input of  
user presentation control commands; and  
10 means for controlling system operation including:
    - means responsive to the user input selection for  
retrieving and loading the selected medium into one of  
the media access devices; and
    - means for selectively connecting the media access  
15 device loaded with the selected medium to at least one  
of the user terminals to present the accessed  
information to the user;
- characterized by: the means for controlling further  
including means responsive to the input of user  
20 presentation control commands for controlling the media  
access device and the presentation of the accessed  
information during presentation thereof to the user at the  
user terminal.

2. The system as in Claim 1 further characterized by the means for controlling including means responsive to the user presentation control for controlling media access device operation to start, stop, pause and scan the medium  
5 loaded into the media access device.

3. The system as in Claim 1 further characterized by the means for controlling including means for limiting the time available for the user to control the operation of the media access device through the input of user presentation  
5 control commands.

4. The system as in Claim 3 wherein the means for limiting includes means for blocking input of user presentation control commands when an elapsed amount of time expended controlling operation of the media access  
5 device exceeds a predetermined time limit.

5. The system as in Claim 1, further characterized by the means for controlling including means for reserving a future time slot for accessing of a medium selected by a user.

- 27 -

6. The system of Claim 1, further characterized by means for performing diagnostic functions on the system, said means comprising:

5 means for performing off-line diagnostic functions;

means for performing self-diagnostic functions on the system; and

means for performing diagnostic functions during system initialization.

- 28 -

7. A method for information delivery, including the steps of:

selecting a medium storing information desired for presentation to a user;

5        selecting one of a plurality of media access devices for accessing information from the selected medium for presentation;

10       selecting one of a plurality of user terminals for presenting the stored information accessed from the selected medium;

connecting the selected media access device to the selected user terminal;

retrieving and loading the selected media into the selected media access device;

15       presenting on the selected user terminal the stored information accessed from the selected medium; and

20       characterized by the step of: inputting user presentation control commands from the selected user terminal to control the selected media access device and the presentation of the accessed information from the selected medium during presentation thereof to the user at the selected user terminal.

8. The method as in Claim 7 further characterized by the step of controlling the selected media access device in response to the input of user presentation control commands by starting, stopping, pausing and scanning the medium loaded into the selected media access device.

9. The method as in Claim 7 further characterized by the step of limiting the time available for the user to control the presentation of accessed information by the selected media access device through the input of user presentation control commands.

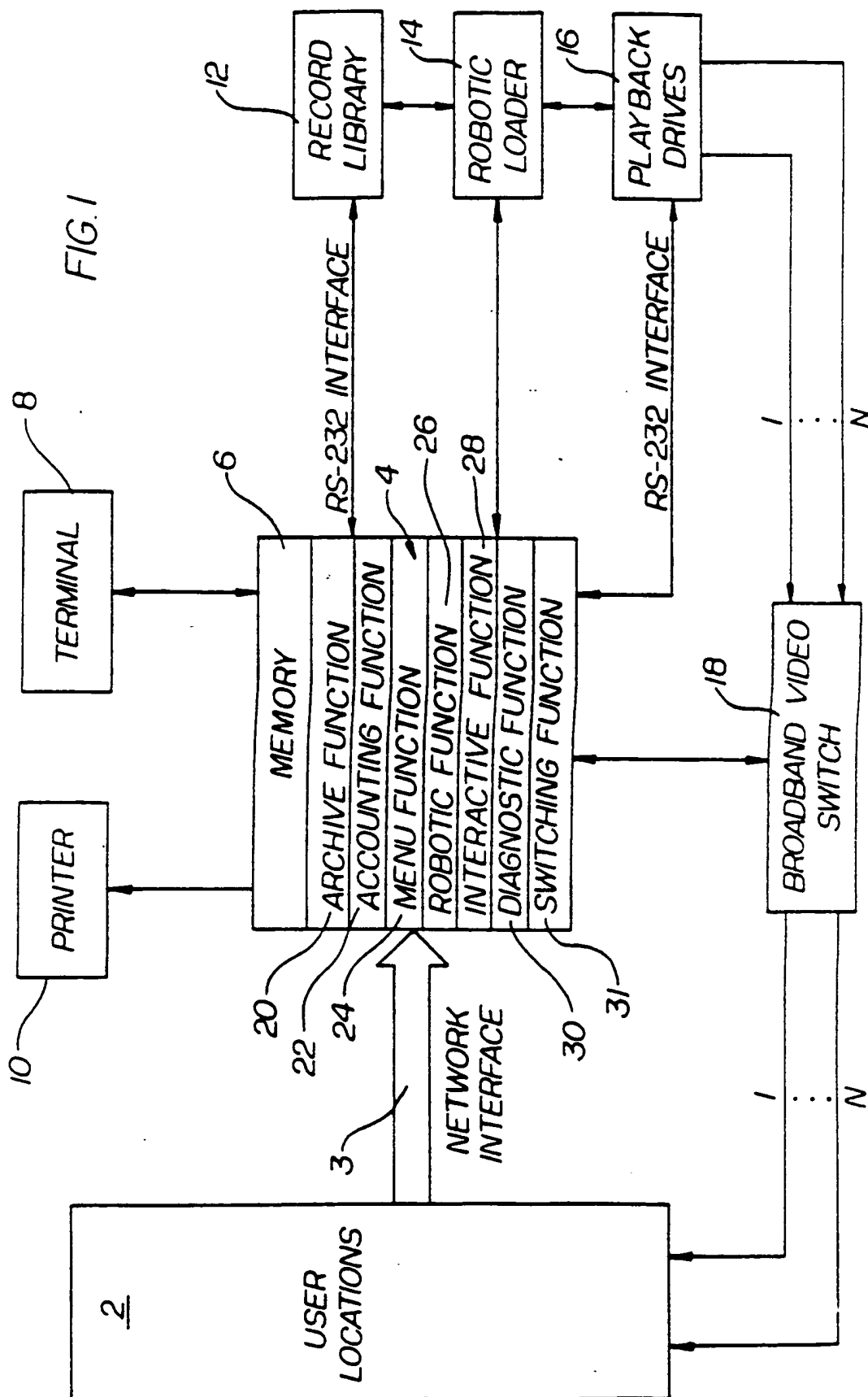
10. The method as in Claim 9 wherein the step of limiting is further characterized by the step of blocking the input of user presentation control commands when an elapsed amount of time expended controlling the presentation of accessed information exceeds a predetermined time limit.

11. The method as in Claim 7 further characterized by the steps of:

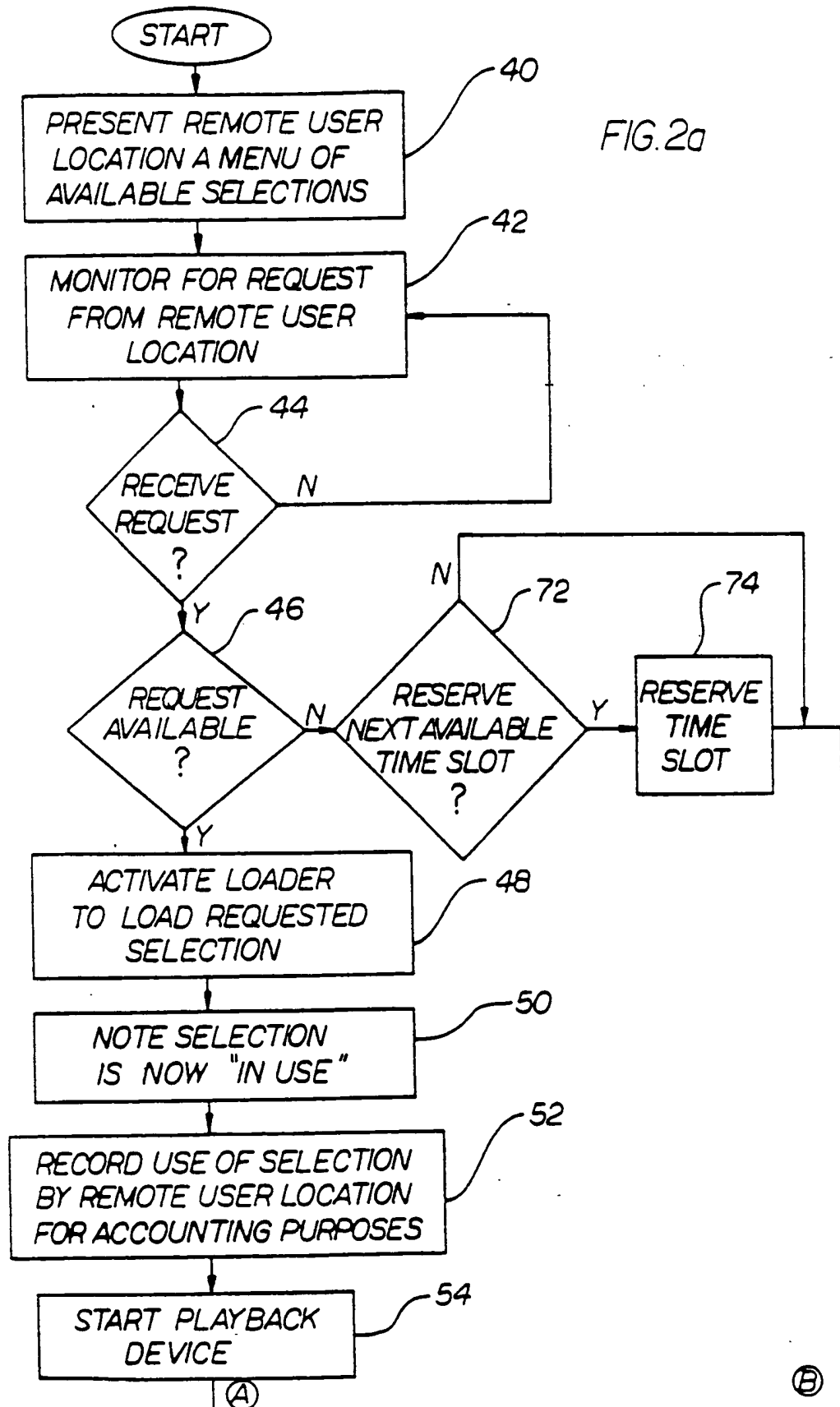
determining the availability of the selected medium; and

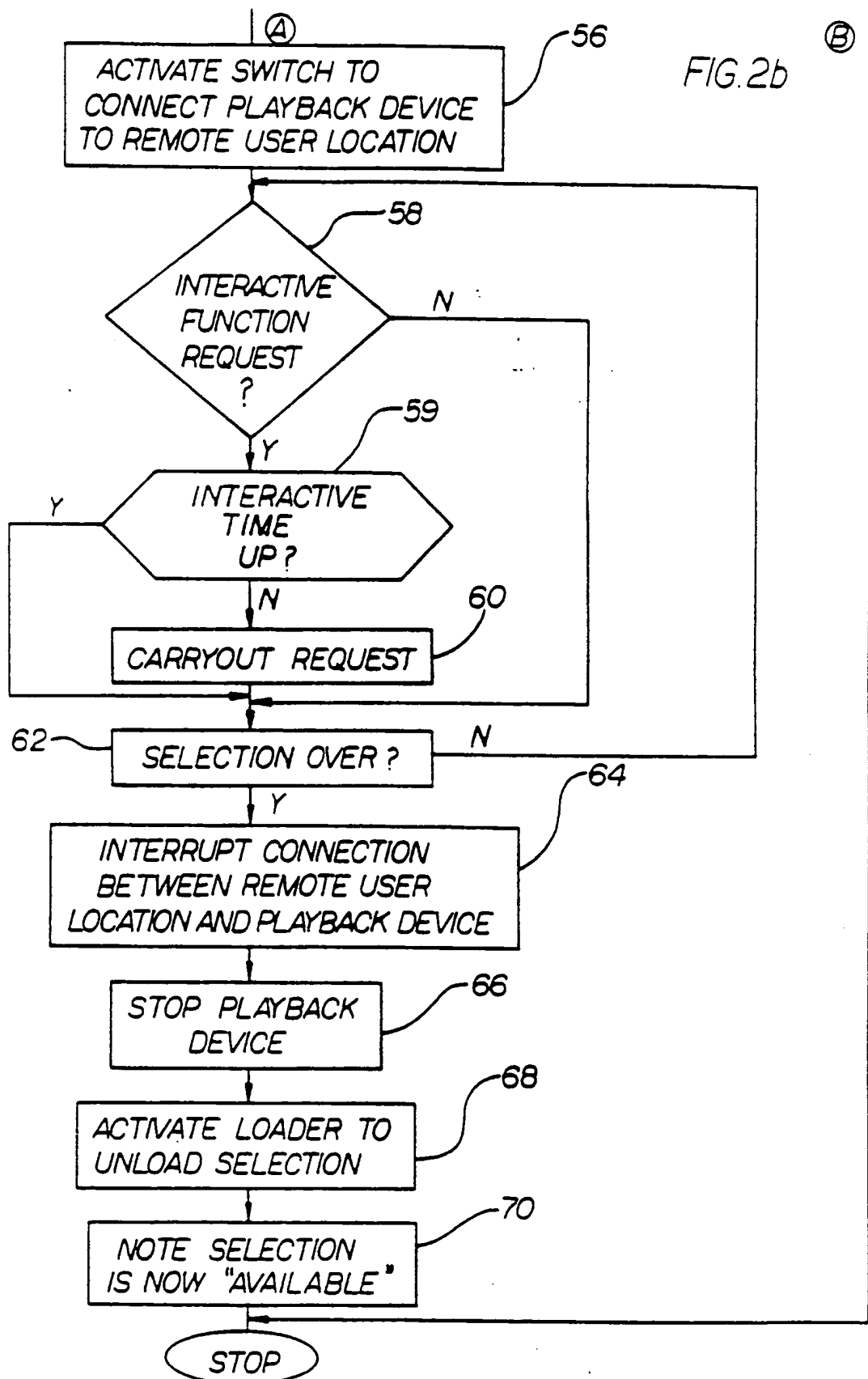
reserving the selected medium for a next available time period.

FIG. 1









## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US93/07318

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) : Please See Extra Sheet.

US CL : 369/30, 32; 360/71; 364/406; 370/14

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 369/30, 32; 360/71; 364/406; 370/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category*     | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.                           |
|---------------|--|---|
| X<br>---<br>Y | US, A, 4,766,581 (KORN et al.) 23 August 1988. See the entire document.  | 1-10, 12-17,<br>and 19-27<br>-----<br>11 and 18 |
| Y             | US, A, 4,485,467 (MILES et al.) 27 November 1984. See col. 1, line 65 - col. 2, line 30 and col. 4, line 45 - col. 5, line 55. | 18  |
| A, P          | US, A, 5,168,481 (CULBERTSON et al.) 01 December 1992. See the entire document.  | 1-27  |

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

|  |   |   |  |
|--|---|---|--|
| Special categories of cited documents: |   |   |  |
| *A*                                    | document defining the general state of the art which is not considered to be part of particular relevance   | *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |  |
| *E*                                    | earlier document published on or after the international filing date  | *X*   | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone   |
| *L*                                    | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | *Y*   | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| *O*                                    | document referring to an oral disclosure, use, exhibition or other means  |   |  |
| *P*                                    | document published prior to the international filing date but later than the priority date claimed  | *A*   | document member of the same patent family  |

Date of the actual completion of the international search

17 September 1993

Date of mailing of the international search report

08 NOV 1993

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Authorized officer

Xuong M. Chung

Facsimile No. NOT APPLICABLE

Telephone No. (703) 305-9772

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US93/07318

## A. CLASSIFICATION OF SUBJECT MATTER:

IPC (5):

G11B 17/22, 15/18; G06F 15/00; H07J 1/16